The Journal of Developing Areas, II (April, 1968), 343-362.

Economic Development with Limited Supplies of Labor

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It was in 1954 when we were first presented with the original two-sector Lewis model of capital accumulation and economic growth.[1] As Lewis himself pointed out, his approach was similar to that of the Classical School,[2] and in stressing the importance of profits as the sole source of savings his model was Ricardian. It was Ricardian also, as distinct from Classical, in relating changes in output to investment in

[1]W. Arthur Lewis, "Economic Development with Unlimited Supplies of Labour," *Manchester School of Economic and Social Studies*, XXII (May 1954), 139-91, hereafter cited as "Unlimited Supplies of Labour."

[2]Lloyd G. Reynolds traces the concept of an unlimited labor supply back to Ricardo and Marx. See his "Wages, Productivity and Industrialization," in *Problems of Economic Development*, ed. E. A. G. Robinson (London: Macmillan, 1965), p. 311. However, G. Ranis, in his review of growth theories in the same volume, maintains that Lewis "was the first to advance the . . . assumption of an 'unlimited' supply of labour," *ibid.*, p. 16.

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physical capital.[3] Not that Lewis regarded economic development as anything but multidimensional—witness his approach in his monumental *Theory of Economic Growth* (1955), wherein he relates economic development to the will to economize, economic institutions, and human knowledge, prior to discussing capital as a generator of economic growth. But in the model[4] which supports his general approach, he was Ricardian in selecting capital as the prime mover, with savings out of profits being the principal source of this capital.

Some four years later, Lewis published some "Further Notes" on his original classical model, but added little if anything of substance to it. The main purpose of this follow-up article was to set out "in more detail the classical position"[5] on a number of aspects covered in the 1954 article. Within a decade the Lewis model had gained considerable notoriety, being discussed and evaluated in several of the leading development texts, as well as in the journal literature.[6] Shortly thereafter the model was extended by the work of Fei and Ranis.[7] By the time that it had established itself as a permanent piece of analytic-furniture, however, Lewis himself had begun to move away from his original conception of the development process. And in moving along the lines he did, he became more Classical, if less Ricardian, particularly in his attempt to give more emphasis to the productiveness of expenditures on human

[3]But Lewis' model is not Ricardian in stressing a constant money wage of agricultural labor, since the entire message of Ricardo's growth theory was to show that money wages rise during development due to diminishing returns in agriculture. Compare my "A Guide to the Economics of David Ricardo," *Pakistan Economic Journal*, XII (December 1962), 30-62, where it is shown that this is the *raison d'être* for Ricardo's policy recommendations of free trade.

[4]Although Lewis "disclaims the formulation of any general theory of development . . . there is a particular model, from which his main theme springs," P. T. Bauer, "Lewis' *Theory of Economic Growth*," *American Economic Review*, XLVI (September 1956), 632.

[5]"Unlimited Labour: Further Notes," *Manchester School of Economic and Social Studies*, XXVI (January 1958), 1, hereafter cited as "Further Notes."

[6]See G. M. Meier, *Leading Issues in Development Economics* (New York: Oxford University Press, 1964), particularly Meier's summary of the Lewis model on pp. 85-88; S. Enke, *Economics for Development* (London: Dobson, 1963). Most readings books on development and economic growth reprint the original (May 1954) article, e.g., A. N. Agarwala and S. P. Singh (eds.), *The Economics of Underdevelopment* (London: Oxford University Press, 1958), pp. 400-449; and in the journals, W. J. Barber, "Disguised Unemployment in Underdeveloped Economies," *Oxford Economic Papers*, XIII (February 1961), 103-15; S. Enke, "Economic Development with Unlimited Supplies of Labour," *Oxford Economic Papers*, XIV (June 1962), 158-72; G. E. Cumper, "Lewis' Two-Sector Model of Development and the Theory of Wages," *Social and Economic Studies*, XII (March 1963), 37-50; R. Minami, "Economic Growth and Labour Supply," *Oxford Economic Papers*, XVI (June 1964), 194-200; John C. H. Fie, "Per Capita Consumption and Growth," *Quarterly Journal of Economics*, LXXIX (February 1965), 52-72; and L. G. Reynolds, "Wages and Employment in the Labor-Surplus Economy," *American Economic Review*, LV (March 1965), 19-39, hereafter cited as Reynolds, "Wages and Employment."

[7]J. C. H. Fei and G. Ranis, "Unlimited Supply of Labour and the Concept of Balanced Growth," *Pakistan Development Review*, I (Winter 1961), and "A Theory of Economic Development," *American Economic Review*, LI (September 1961). See also

investment and institutional improvements. By 1964 Lewis had evolved a new development model from which he derived a number of interesting policy prescriptions concerning inflation, foreign aid, wages, and government expenditures. These new ideas have appeared in a number of articles,[8] and were brought together and summarized in his Richard T. Ely Lecture given in Chicago in December 1964.[9]

In the section below is a brief outline of the original Lewis model, while in the following section the "new" Lewis model is set forth. The concluding section presents a number of specific numerical models to illustrate the characteristics of the new model, given what we shall call the accumulation, distribution, and welfare conditions, with population growth rates ranging between 2 and 3 percent per annum.

THE ORIGINAL LEWIS GROWTH MODEL

Lewis envisioned a two-sector economy, consisting of a large subsistence sector which included traditional agriculture, petty trading, the services of casuals, and domestic and commercial retainers,[10] and a small but growing capitalistic sector wherein capitalistic methods of production and distribution were used and profits generated.[11] There was a surplus of essentially unskilled labor available for the modernizing sector at a constant wage, institutionally set some 30 percent above the wage ruling in the subsistence sector.[12]

At this (constant) wage the marginal productivity of labor yields a net profit, which is reinvested and results in an increase in the demand for labor—an increase supplied by the traditional sector at the prevailing wage level. As shown in Figure 1 below, as profits increase employment in the capitalist sector grows (from OE^1 to OE^2, etc.) and the "process continues so long as there is surplus labour."[13]

[8]"Consensus and Discussions on Economic Growth: Concluding Remarks to a Conference," *Economic Development and Cultural Change*, VI (October 1957), 75-80, hereafter cited as "Consensus and Discussions"; "Employment Policy in an Underdeveloped Area," *Social and Economic Studies*, VII (September 1958), 42-54; "Some Reflections on Economic Development," *Economic Digest* (Pakistan), III (Winter 1960), 3-8, hereafter cited as "Reflections"; "Unemployment in Developing Countries," Lecture to Mid-West Research Conference (October 1964), mimeographed, 20 pp.; "Allocating Foreign Aid to Promote Self-Sustained Economic Growth," in *Motivations and Methods in Development and Foreign Aid* (Washington, D.C.: Society of International Development, 1964), pp. 20-23, hereafter cited as "Foreign Aid"; "Closing Remarks at the Conference on Inflation and Economic Growth in Latin America," in *Inflation and Growth in Latin America*, ed. W. Baer and I. Kerstenetzky (Homewood, Ill.: R. D. Irwin, 1964), pp. 21-33, hereafter cited as "Inflation and Growth."

[9]"A Review of Economic Development," *American Economic Review*, LV (May 1965), 1-16, hereafter cited as Ely Lecture.

[10]"Unlimited Supplies of Labour," pp. 142-43.

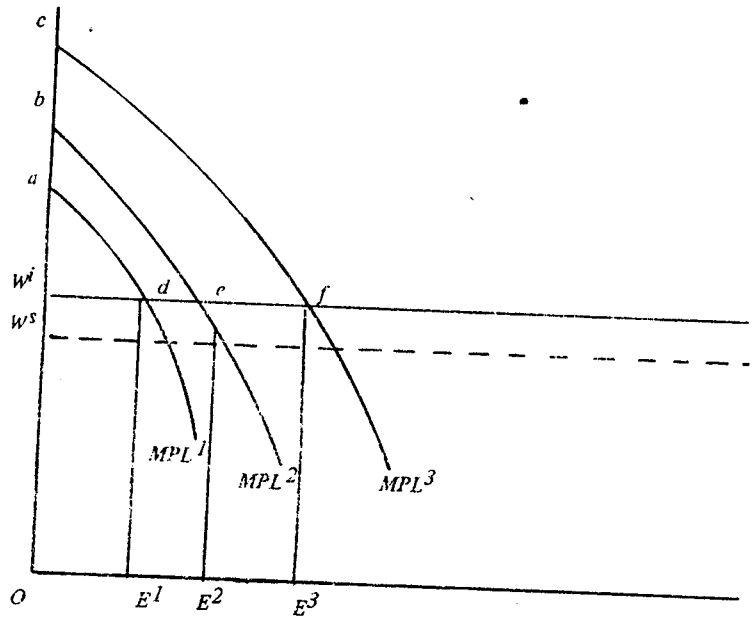
[11]Lewis described the expanding modern sector as "that part of the economy which uses reproducible capital, and pays capitalists for the use thereof," "Unlimited Supplies of Labour," p. 146.

[12]*Ibid.*, p. 150.

[13]*Ibid.*, p. 152. Figure 1 is an adaptation of Lewis' Fig. 3, p. 152. W^s represents

Of the three main explanations of why profits (the capitalists' surplus) continue to grow under capitalism (foreign trade, new inventions, and inflation), Lewis felt that it was the third which was the "most convincing."[14] In a country possessing industrial entrepreneurs willing to reinvest their profits in industry, inflation can promote industrialization in the sense that within a decade or two, the proportion of national savings to income can be increased from about 5 percent where income is growing barely as fast as population, to a level of 10 percent or more, sufficient for per capita incomes to increase by 2 percent and thus satisfying the growth objective of most less developed countries.[15]

FIGURE 1: EXPANSION IN THE CAPITALISTIC SECTOR



Lewis views inflation favorably since he envisions it as a "profit inflation" where the rate of capital formation increases as prices advance ahead of wages.[16] Indeed, in Lewis' model, strictly speaking, wages are

[14] *Aspects of Industrialisation* (Cairo: National Bank of Egypt, 1953), p. 16, hereafter cited as Cairo Lecture.

[15] *Ibid.*, p. 17.

[16] His discussion here parallels that of Keynes in *A Treatise on Money* (London: Macmillan, 1930), II, 149-63, hereafter cited as Keynes, *Treatise*. In the following year Lewis stated: "the fundamental explanation of any 'industrial revolution,' that is to say, of any sudden acceleration of the rate of capital formation, is a sudden increase in the opportunities for making money . . . . This increase in capitalist profits is also accelerated by the inflations which occur regularly in all capitalist economies. Inflation raises profits relatively to [illegible]

constant so that all the price-induced surplus accrues as profits and is assumed to be reinvested. What Keynes called "income inflation" has no place in the Lewis scheme of things. It is true that profit inflation brings about a more unequal distribution of wealth and income, but Lewis again shares Keynes's view that "so long as wealth and its fruits are not consumed by the nominal owner but are accumulated, the evils of an unjust distribution may not be so great as they appear."[17] Both Keynes and Lewis immediately add that the structure of taxes can be designed to alter the distribution of incomes if so desired.[18]

Lewis recognizes that the cost of labor to the capitalist sector may rise even before the "surplus" in agriculture is exhausted—productivity in agriculture may rise, the sectoral terms of trade may begin to favor agriculture, or "capitalist workers [may] raise their standard of what they need for subsistence."[19] Foreign trade may postpone this "turning point," but even if population is growing, since capital normally expands faster than population, development with unlimited supplies of labor must eventually come to an end. The economy then moves on to a "new stage of development,"[20] beyond the confines of Lewis' original model, into what Lewis calls "The Open Economy."[21] But during the critical transition, labor is available at constant wages; and if "conditions are favourable for the capitalist surplus to grow,"[22] economic development does take place—and at a rate directly related to savings, which in turn are tied to capitalist profits.

Briefly then, Lewis' original message was to the effect that growth is a function of capital accumulation, which in turn is dependent upon private and public savings. Lewis pinpoints profits, as distinct from land rents, as the primary source of savings, so that there exists a direct relationship between the share of profits in national income and the rate of expansion of the economy. Apparently countries are poor, not because of low incomes but "because their capitalistic sectors are so small."[23] Poor, largely agricultural economies manage to save and invest annually only about 5 percent of their national incomes, whereas progressive economies with big capitalistic sectors invest some 12 percent or more per annum. As a consequence, "the central problem in the theory of economic development is to understand the process by which a community which was previously saving and investing 4 or 5 percent of its national income or less, converts itself into an economy where voluntary

[17] Keynes, *Treatise*, II, 163.

[18] Cairo Lecture, pp. 18-19; Keynes, *Treatise*, II, 162. Interestingly, Keynes concluded that the "dilemma between Thrift and Profit as the means of securing the most desirable rate of growth for the community's aggregate wealth" can perhaps best be eliminated by the rate of capital development "becoming more largely an affair of state, determined by collective wisdom and long views" (p. 163).

[19] "Unlimited Supplies of Labour," p. 175.

[20] *Ibid.*, p. 176.

[21] *Ibid.*, pp. 176-89.

saving is running at about 12 or 15 percent of national income or more."[24] We shall call this Lewis' First Law of Economic Dynamics.

A country becomes a 12 percent saver mainly "by the growth of the capitalist sector relative to the rest, resulting from the continuous reinvestment of the capitalist profits."[25] Thus, the essential feature of this transformation from low to high saving is the "enormous increase in the share of profits" in national income.[26]

We can see more clearly the logic behind Lewis's argument for a higher saving ratio if we put it in terms of an aggregate growth equation. Presumably the development objective is to raise the growth of national output from a level barely able to keep pace with population to a level capable of sustaining an annual 2 percent increase in per capita incomes.[27] With population increasing, say 2 percent annually, this implies an approximate doubling in the rate of income growth (G). In the traditional economy, however, the principal industry is agriculture, with a low capital-output ratio at the margin. As long as output is increasing only as fast as population, it is unlikely that the shortages or bottlenecks which one expects to encounter in the "takeoff" stage will appear, so that the marginal capital coefficient (k) should be low and stable—perhaps around 2:1. In terms of the growth equation we have $G = s/k$, which can be written as $s = Gk$, where:

G = the annual rate of increase in national income,
s = the annual average rate of savings (the savings-income ratio), and
k = the marginal capital-output ratio, or the number of dollars of investment required to increase net output by one dollar.

Thus, with G equal to 2 percent and k around 2:1, the annual rate of savings will approximate 4 percent—close enough to Lewis' "5 percent or less."

But during the transitional period, the national effort to raise G to 4 percent (to sustain a 2 percent per capita growth rate) forces the marginal capital coefficient to rise sharply from a level of about 2:1 to somewhere between 3:1 and 4:1.[28] Required savings, being equal to the product of Gk, must therefore be increased to within the range of 12-16 percent. It follows that "all the countries which are now relatively developed have at some time in the past gone through a period of rapid acceleration, in the course of which their rate of annual investment has moved from 5 percent or less to 12 percent or more,"[29] thus complying with what we have called Lewis' First Law of Economic Dynamics.

It bears repeating that the above outline is not Lewis' theory of economic development, if indeed it may be said that he has *a* theory of development, but it is a brief description of his basic model which underlies that first stage of development where there is an unlimited (i.e., perfectly elastic) supply of labor available to the capitalist sector of a growing economy.

THE NEW LEWIS GROWTH MODEL

It is our contention that in recent years, beginning perhaps with the decade of the 1960's, Lewis has so modified his original thinking that it may be said he now operates with a completely new model. His new analytical framework is designed to stress two important facts: (1) development with unlimited supplies of labor no longer seems to be politically possible, even within the first stage of the critical transition, and (2) under "primitive" conditions most government expenditures (excepting only welfare transfer payments and those on the military) are as productive in raising the capacity or potential to grow as are public and private investment in physical capital. Thus, Lewis now appears to be using a generalized conception of capital[30] so that any expenditure increasing the flow of knowledge or improving the quality of productive factors (especially labor) is to be treated as investment, increasing the capacity of the economy to produce. These expenditures, together with investment in physical capital, all come out of the "surplus" of national income above private consumption. Lumping them together in this manner we may call them development expenditures which increase the stock of physical, human, and institutional capital.

The Rising Cost of Labor. In the original Lewis model it was physical capital that made the economy run. Of course, it was realized that capital alone was not sufficient for growth, but it was generally assumed that either the other complementary factors were present or additional capital would bring them in its train.[31] Shortages of complementary factors were not a problem during the transitional stage of growth. Indeed, the most prominent characteristic of Lewis' early writing was the assumption of unlimited availability of constant-cost labor. Throughout the critical transition, the economy apparently was supposed to be able to resist the various political pressures for an upward adjustment of wages, so that in effect all income increments would be reinvested and the growth rate maximized. The possibility of having to trade off interim increases in wages and living standards for acceptable (but less than maximum) growth rates did not arise in "labor surplus" economies, at least not until they ceased to be underdeveloped "and graduated into

[24] "Unlimited Supplies of Labour," p. 155.

[25] *Economic Growth*, p. 233.

[26] *Ibid.*, p. 226.

[27] See Lewis, "United Nations Primer for Development," *Quarterly Journal of Economics*, LXVII (May 1953), 268-69. "An appropriate target is that national income should increase by 2 per cent per head per year," "Consensus and Discussions," p. 77. This becomes in 1960 the "desired growth rate." Compare "Reflections," p. 3.

[28] *Economic Growth*, pp. 201-2, 206-8. See also the article by Rudolph Bicanic, "The Threshold of Economic Growth," *Kyklos*, XV (1962), pp. 7-28, stressing the sharp rise in the capital coefficient during the takeoff, and my own, *The Concept of Elasticity and the Growth Equation* (Bombay: Asia Publishing House, 1961), particularly chap. 4.

[29] *Economic Growth*, p. 208.

[30] For a similar approach, emphasizing human as distinct from institutional forms of investment, see Harry G. Johnson, "Towards a Generalized Capital Accumulation Approach to Economic Development," a mimeographed paper given at the Conference on the Residual Factor in Economic Growth, sponsored by the Organization of Economic Cooperation and Development, n.d.

[31] Perhaps this accounts for Lewis' view that shortages of skills are not a serious bottleneck in developing economies. Compare his "Unlimited Supplies of Labour,"

the family of mature economies."[32]

But the increasing frequency of "premature" rises in wages because of "noneconomic reasons—a rise in conventional standards of life, voluntary increases granted by the capitalists on moral grounds, trade union pressure, or government regulation,"[33] which Lewis noted only in passing in his original model, eventually forced Lewis to broaden his theoretical model to incorporate this new (and nonclassical) fact of life for developing countries. Since savings ratios are extremely low in the less developed countries, one might have thought that Lewis would have lamented the political necessity of raising wages and consequently increasing levels of per capita consumption. Such was not Lewis' reaction, partly because he realized that higher wages meant more incentive and greater effort on the part of the working class and thus higher output to offset the increased rate of consumption. Recently this happy relation has been dubbed the "feedback phenomena upon the human agent,"[34] thus echoing, indeed seconding, Arthur Smithies' analysis of the production response to the so-called "demonstration" effect.[35]

Lewis also has another reason for not bemoaning higher wages. He points out that rising per capita consumption is perfectly consistent with an increasing proportion of national income being made available for development purposes. Indeed, in his new model Lewis insists that as the proportion of personal consumption is being squeezed from its "traditional" level of about 80 percent of national income to a level of 70 percent, capable of promoting self-sustaining growth, per capita consumption must also be rising. The share of consumption in national income can be reduced, Lewis notes, but not if consumption is falling in absolute terms, for "the public will always fight to keep its absolute standards up."[36] The squeeze on the consumption ratio is thus limited to a rate consistent with a steady increase in per capita consumption. Economic development with unlimited supplies of labor apparently is a thing of the past.

A Generalized Conception of Capital Formation. In his 1955 book Lewis listed and discussed in some detail three proximate causes of economic growth—capital accumulation, technological progress, and the strength of economic motivations. In his 1954 model only the first of these causes is singled out as the prime mover, although in advocating a judicious turning of the monetary tap so that the economic environment is made more conducive to profit making, some attention was paid

[32] Fei, "Per Capita Consumption and Growth," p. 53.

[33] Reynolds, "Wages and Employment," p. 21.

[34] N. Rosenberg, "Neglected Dimensions in the Analysis of Economic Change," *Bulletin: Oxford University Institute of Economics and Statistics*, XXVI (February 1964), 60.

[35] Smithies, "Rising Expectations and Economic Development," *Economic Journal*, LXXI (June 1961), 255-72. Rosenberg, "Neglected Dimensions in the Analysis of Economic Change," traces the incentive response from increased wages in terms of extra production to the writings of Hume and Smith, and R. V. Eagly finds an analysis of the relation in the writings of Sir James Steuart. See his "Sir James Steuart and the Aspiration Effect," *Economica*, XXVIII (February 1961), 53-61.

[36] "Inflation and Growth," p. 30.

to motivations. In his new model, the concept of capital accumulation is broadened to include the productiveness of investment in human and institutional as well as physical capital. Lewis therefore now stresses the importance of raising the share of what we will call "development expenditures," and no longer places primary emphasis on increasing the savings ratio. This is because he now maintains that "expenditures on public services is just as necessary to growth as is capital investment."[37]

While the possibility of enhancing growth by the monetary tap in order to engender self-liquidating inflationary conditions is still given favorable consideration, the new model seems to be designed primarily to accommodate the larger role which Lewis wishes to give to the government in achieving self-sustained growth. In his 1960 Williams College Lecture, Lewis made his case for "state capitalism" in this fashion:

> As capitalism develops within a backward economy, the proportion of the national income accruing as capitalist profits increases . . . until the economy is fully converted to capitalism, when the share of profits in the national income is stabilised. All the countries now developed have gone through this process, except the U.S.S.R.; and the countries now in line for development can tread the same path if they so desire . . . . For the most part they do not so desire. This is not primarily because of anticapitalist ideology . . . . Their main objection to relying solely on the growth of private capitalism is that it is so slow. By this method it may take anything up to a century to raise the rate of domestic saving from 5 to 10 per cent. Most political leaders want quicker results than this. Taxation provides a more rapid alternative . . . .[38]

Increased taxation will make possible more rapid growth for two reasons: First, the extra government income it implies will result in larger public savings, so that the rate of physical capital accumulation will be enhanced. To accomplish this, of course, marginal tax rates must be set considerably above the existing average rates so that the slow rate of increase of private savings will not be permitted to extend the transitional period beyond Lewis' twenty-year limit.[39]

Lewis then stresses that even when private savings remain at 5 percent of national income, if the share of income going to government is raised to 20 percent, it is possible to lift the national savings effort to about 13 percent "within ten years."[40] This implies, of course, a relatively high rate of savings out of taxes. If government income is split "60-40" in terms of current and capital expenditures, this high level of public savings can then meet the demand for extensive overhead investment required during the transitional period. Under these conditions Lewis concludes, "it is quite appropriate for the major part of saving to be done on public account."[41]

Secondly, Lewis states that increases in government taxing power help to accelerate growth in yet another way, aside from their contribution to increasing national savings. The 12 percent of national income

[37] "Reflections," p. 4.

[38] *Ibid.*, p. 5.

[39] *Ibid.*

[40] *Ibid.*

[41]

now spent on the regular budget Lewis regards as equally important for development as expenditures on the capital budget. Excepting welfare transfer payments and expenditures on the military, Lewis considers government current expenditure essential in building up the required framework of public services. As stated in his Ely Lecture, "where public services are rudimentary, rapidly increasing expenditures on these services are just as important as increased savings."[42]

Government expenditures on public services, which he regards as investment in human and institutional capital, now take their place beside the "saving-investment-in-physical-capital" mechanism. Raising the saving ratio no longer is the "central problem in the theory of economic development."[43] Instead, the emphasis now is on raising what we have called the development expenditures ratio—expenditures which increase the stock of physical, human, and institutional capital and the sources of which are savings and taxes. Lewis would now argue that the volume of development expenditures should increase some 50 percent faster than the annual rate of growth of national income. In summing up the discussion at the Rio Conference on Inflation, Lewis stated that "taxes and savings taken together should not rise in real terms faster than about 6 percent per annum, when national income is rising by . . . 4 percent."[44] Note that Lewis says development expenditures should grow not faster than 6 percent, i.e., not more than 50 percent faster than national income growth. The reason for putting this negatively is that despite the new emphasis on investment in human and institutional capital, Lewis now also insists that per capita consumption must rise as well during the transition. In his latest book he put the matter in these words:

> If the purpose is only economic development, one may assume that an *absolute* fall in consumption is out of the question, since very few people are willing to have their consumption forcibly reduced this year in return for an uncertain promise of an increase in "GDP" next year . . . . Attempts to bring about an absolute fall in consumption, whether through taxation or through inflation, always results in strikes, and they ultimately fail because people insist on raising their money incomes sufficiently to offset increased taxes . . . . An increase in *per capita* output unaccompanied by an increase in *per capita* consumption is therefore inconceivable, at least in a free society.[45]

In his Ely Lecture Lewis also stressed that not only must per capita consumption increase during the transition, but that it should "grow at least 60 percent as fast as per capita output."[46]

In effect, Lewis is now stressing the need for a *simultaneous* increase in real wages and the development expenditure ratio, the latter including savings and productive government expenditures. We previously summarized the old Lewis model in terms of an aggregate growth equation—relating savings and the marginal capital output ratio. At this point, using Lewis' generalized conception of investment to include expenditures in physical, human, and institutional capital, we may rewrite the growth equation and summarize Lewis' new analytical model in terms of it.

In view of Lewis' generalized conception of capital, we may now consider national income as being composed of consumption and development expenditures, i.e., $Y = C + D$, where:

- C = private consumption, and
- D = $(Y\text{-}C)$ represents Lewis' "surplus income," composed of three capital flows:
- I = investment in physical plant,
- H = investment in human capital, and
- A = institutional investment improving the economy's administrative and organizational structure. Thus
- D = $(I + H + A)$, and consequently, $Y = C + I + H + A$.

A new growth equation may now be written as: $G = d/c$, where:

- G = the annual rate of growth of national income,
- d = the annual average rate of development expenditures (savings + productive government expenditures as a percent of national income), and
- c = the marginal capacity-output ratio, or the number of dollars of "generalized" investment in physical, human, and institutional "capital" required to increase net output by one dollar.

The marginal capacity-output ratio (which corresponds to the marginal capital-output ratio in the old growth equation) represents the change in the economy's "capacity to produce" as compared to a change in the national income, or GNP. The development ratio (d) represents Lewis' surplus income over and above private consumption, and by and large, represents savings plus taxes.[47] Hypothetically, if (d) in any given year is 10 percent and the marginal capacity-output ratio is 4:1, the rate of growth in GNP would be 2.5 percent.

It used to be said that given the marginal capital coefficient (k), a rise in the savings ratio (s) would increase G; conversely, given s, an increase in the marginal capital coefficient would lower G. The same analysis holds for the new growth equation, only now it should be apparent that given *both* the marginal capacity coefficient (c) and the development ratio (d), growth may be higher (or lower) depending upon whether d is composed mostly of I, with H and A minimized, or whether a high proportion of d is made up of H and A with I kept low. Indeed, Lewis' latest policy statements seem to imply that, given d, the rate of

[42] Ely Lecture, p. 3, and "Foreign Aid," p. 22. That Lewis considers this a necessary, but not sufficient, precondition of rapid growth is made clear by his evaluation of Ghana's planning experience. There he noted that despite the "remarkable increase in public facilities . . . remarkably little increase in the output of commodities" occurred because the plan failed also to "stimulate private investment," *Economic Bulletin* of the Economic Society of Ghana, p. 4 of a reprint from the June-July 1959 issue.

[43] "Unlimited Supplies of Labour," p. 155.

[44] Specifically Lewis said, "when national income is rising by 3 or 4 percent," but 3 percent is irrelevant in the sense that with populations growing at least 2 percent, countries must grow at least 4 percent if they are to achieve Lewis' minimum growth rate of 2 percent per capita. The quotation is from "Inflation and Growth," p. 33.

[45] *Development Planning: The Essentials of Economic Policy* (New York: Harper and Row, 1966), pp. 161-62, hereafter cited as Development Planning.

[46] Ely Lecture, p. 3.

[47] Assuming there are no "unproductive" (welfare and military) government expendi-

growth will be different depending on the mix of development expenditures between I, H, and A.

In terms of these new structural relationships we may summarize Lewis' new policy dictums and related observations as follows:

1. C/Y = the average (private) consumption ratio. This rate in traditional economies is roughly 80 percent, which Lewis feels is too high and therefore must be reduced to 70 percent within twenty years.
2. $D/Y = d$ = the average development expenditure-income ratio, which in a traditional economy is too low (roughly 20 percent) and within twenty years must be increased to 30 percent. This means not only must savings be increased relative to income but the government's share as well, since development expenditures are a function of both savings and taxes.
3. The fall in C/Y and the rise in D/Y must take place at a controlled rate of 1/2 of 1 percent per year, i.e., in the first year C/Y falling from 80 to 79.5 percent and D/Y rising from 20 to 20.5 percent and so on.
4. Lewis also stipulates that per capita consumption (C/P) must rise during the critical takeoff (threshold or breakthrough), and further, that the rise in C/P should be about 60 percent of the increase in per capita income (Y/P).
5. Lewis suggests that the rate of growth in development expenditures should be about 50 percent above the rate of growth of GNP, that is, the rate of growth of D should be 1.5 times the rate of growth of GNP. Note this is not in per capita terms.
6. Lewis observes that population growth rates, which were about 2 percent per annum in the 1950's, are now between 2.5 and 3 percent. Finally, in primarily agrarian societies he feels that the maximum possible rate of growth of real GNP cannot exceed 5 percent for any length of time.

The above observations, restraints, and structural relationships can be restated in terms of three headings—accumulation, distribution, and welfare.

Accumulation Condition. Development expenditures should increase faster than the increase in national income, and preferably about (but not more than) 50 percent faster. This means savings and taxes together must increase relative to national income so that marginal saving and tax rates must be close to 50 percent higher than average saving and tax rates. During the twenty-year transition period, the development expenditure ratio (d) must be increased from about 20 to 30 percent of national income. This rise in the development ratio, given Lewis' 5 percent ceiling rate of growth in national income, implies a rising marginal capacity-output ratio during the critical transition phase of development.

Distribution Condition. In order to provide for a rising D/Y ratio, it is necessary that C/Y must fall from 80 to 70 percent during the twenty years of the transition from a traditional economy to a developed economy. That this fall in the C/Y ratio must not occur too rapidly is imposed by Lewis' third condition, namely that per capita consumption must rise during the transition since "growth will not occur without incentives."

Welfare Condition. Because of the positive output effect from increased

incentives (due to higher living levels), Lewis stipulates that not only must per capita consumption (C/P) rise during the transition, but that preferably it should rise by 60 percent of the growth in per capita real output (Y/P).

An economy which satisfies the accumulation, distribution, and welfare conditions may be said to be developing according to Lewis' Second Law of Economic Dynamics. The question that immediately arises is: Is it possible to do so? Lewis himself has insisted that during the difficult transitional period total output, at least over long periods of time, can not grow faster than the ceiling rate of 5 percent per annum. Indeed, because of the predominance of the agricultural sector, and as long as it remains "the most neglected," Lewis has noted that the "elementary arithmetic of economic growth [makes it] easy to show that national income cannot attain a rate of 5 percent."[48] Ceilings on income growth rates coupled with the need for an increasing share of national income being allocated to development expenditures necessitates rising marginal capacity-output ratios. Since throughout the developing world population growth rates are higher than they were in the 1950's, ranging between 2 and 3 percent per annum, achieving 2 percent *per capita* income growth rates will be all the more difficult, particularly since unlimited supplies of labor are no longer available at constant wage rates. Under contemporary conditions, not only must an increasing share of national income be allocated to development purposes, but at the same time per capita consumption must be increasing; yet, despite rising per capita consumption levels, the share of private consumption in national income must be steadily squeezed to permit an increasing proportion of total output to be allocated to increasing the stocks of physical, human, and institutional capital. At least one writer is terribly pessimistic about the possibility of developing countries fulfilling Lewis' Second Law of Economic Dynamics. During the transitional period which he calls "the threshold" (after Bicanic[49]), the process to surmount it will be a "painful creep," necessitating not rising but falling living standards.[50]

Notwithstanding the stringent conditions of the threshold, when the new Lewis dictums are formulated in terms of a modified growth equation, it can be shown that the various conditions of Lewis' Second Law of Economic Dynamics are mutually consistent in the sense that, given the distribution condition, the attainment of the welfare and accumulation conditions is possible. That is to say, attaining *self-sustaining* growth, with all that this implies, is not beyond the capacity of the developing countries.

THE NEW LEWIS MODELS

It would appear that the basic question which the new Lewis models have to answer is the following: If an economy with population growing

[48] Ely Lecture, pp. 5-6.

[49] Bicanic, "The Threshold of Economic Growth."

[50] W. C. Peterson, "Investment and the Threshold of Economic Growth," *Kyklos*, XVIII (1965), 132-38, and my critique of Peterson's thesis, "Investment and Per Capita Consumption During the Threshold of Economic Growth," *Economic Development*

between 2 and 3 percent each year can increase its national income (Y) no faster than 5 percent per annum, is it possible to decrease the C/Y ratio from 80 to 70 percent in twenty years (thereby raising the D/Y ratio from 20 to 30 percent) and still achieve: (1) an increase in *per capita* C equal to 60 percent of the rate of growth of *per capita* Y, *and* (2) attain a rate of growth of development expenditures (D) some 50 percent faster than Y is growing? In other words, are the accumulation, distribution, and welfare conditions of Lewis' Second Law both consistent and feasible so that self-sustaining growth is achievable? In order to show that the answer is in the affirmative, we give below three arithmetical models in each of which the economy is achieving Lewis' minimum rate of progress (i.e., per capita Y growing 2 percent per annum) with population increasing 2, 2.5, and 3 percent annually, and thus national income growing within the ceiling of 5 percent per annum. We then impose Lewis' distribution condition by reducing the C/Y ratio (thus increasing the D/Y ratio) by 1/2 of 1 percent per annum (cols. 4 and 5). Knowing the C/Y and D/Y ratios and given annual income, we can compute total C and D (cols. 2 and 3), and dividing by population (col. 6) obtain per capita C and D (cols. 7 and 8). The last column (9) in each table gives us the ratio of per capita C growth to per capita Y growth, which if it is to satisfy Lewis' welfare condition must be .6, i.e., per capita C must increase at least 60 percent as fast as per capita Y. Below the table for each model we show the growth rate of D; and since the rate of growth of Y is given, the ratio of these two growth rates is obtained. The accumulation condition is satisfied providing this last ratio is in the neighborhood of (but does not exceed) 1.5, i.e., development expenditures are increasing faster than national income, but not by more than 50 percent faster. What do the models show?

Let us examine first the welfare condition, i.e., the effect on living standards, as measured by per capita C, of imposing the distribution condition. Since national income is growing at a constant rate and the share of C in Y is declining, the rate of growth of C must be decreasing and, indeed, since the rate of growth of per capita Y is fixed, the rate of growth of per capita C must also be falling—as it is in column 9. But the rate of growth of per capita C fulfills the Lewis welfare requirement in the sense that, even though declining, by the end of the twenty-year transition period per capita C is still growing 60 percent as fast as per capita Y in all three models. In the early years in each case, though, the rate of growth of per capita C exceeds the Lewis welfare requirement, starting out at a rate approximately two-thirds of the growth of per capita Y, gradually declining, and as it were, sliding into the Lewis welfare condition in the twentieth year when the ratio is almost exactly 60 percent of the growth rate of per capita Y—being a little higher, the lower the rate of population growth. After the transitional period has ended, if the division of Y is maintained at this 70-30 percent ratio in terms of C and D, then consumption growth would become equal to that of the growth rate of national income. So too would the growth rate of development expenditures, thus signifying the beginning of the stage of self-sustained growth.

As far as the accumulation condition is concerned, since the share of Y set aside for development expenditures (d) is increasing during the

MODEL 1
POPULATION GROWTH–2 PERCENT, INCOME GROWTH–4 PERCENT

Year	$Y = C + D$			C/Y	D/Y	*Population Index*	*Index of:* Per Capita C	*Index of:* Per Capita Y	$\frac{G_{C/P}}{G_{Y/P}}$
	1	2	3	4	5	6	7	8	9
0	100.00	80.00	20.00	80.0	20.0	100.0	100.00	100.00	. . .
1	104.00	82.68	21.32	79.5	20.5	102.0	101.32	102.00	.660
2	108.16	85.45	22.71	79.0	21.0	104.0	102.70	104.00	.663
3	112.49	88.30	24.19	78.5	21.5	106.1	104.03	106.00	.667
4	116.99	91.25	25.74	78.0	22.0	108.2	105.36	108.00	.663
5	121.67	94.29	27.38	77.5	22.5	110.4	106.76	110.12	.662
6	126.53	97.43	29.10	77.0	23.0	112.6	108.16	112.23	.662
7	131.59	100.67	30.92	76.5	23.5	114.9	109.52	114.49	.656
8	136.86	104.01	32.85	76.0	24.0	117.2	110.93	116.73	.652
9	142.33	107.46	34.87	75.5	24.5	119.5	112.40	119.02	.647
10	148.02	111.02	37.00	75.0	25.0	121.9	113.84	121.36	.646
11	153.95	114.69	39.26	74.5	25.5	124.3	115.33	123.73	.641
12	160.10	118.47	41.63	74.0	26.0	126.8	116.78	126.25	.640
13	166.51	122.38	44.13	73.5	26.5	129.4	118.21	128.81	.635
14	173.17	126.41	46.76	73.0	27.0	131.9	119.80	131.35	.634
15	180.09	130.57	49.52	72.5	27.5	134.6	121.25	133.92	.631
16	187.30	134.86	52.44	72.0	28.0	137.3	122.77	136.55	.626
17	194.79	139.27	55.52	71.5	28.5	140.0	124.34	139.22	.622
18	202.58	143.83	58.75	71.0	29.0	142.8	126.00	141.95	.620
19	210.68	148.53	62.15	70.5	29.5	145.7	127.42	144.73	.617
20	219.11	153.38	65.73	70.0	30.0	148.6	129.02	147.58	.612

Annual Average: Growth of D–6 percent, Growth of Y–4 percent; Ratio–1.5.

twenty-year transition, the rate of growth of D must be greater than the rate of growth of Y. Lewis specified, however, that the share of D must not increase faster than 1/2 of 1 percent annually and stated that this would mean that D would be growing approximately 50 percent more than Y was increasing. The models indicate that with population growth at 3 percent, the ratio of the rate of growth of D to the rate of growth of Y turns out to be 1.44, rising to 1.47 when population is growing at an annual rate of 2.5 percent, and reaching Lewis' limit of 1.5 when population is growing only at a 2 percent rate.

So we find that all three of the Lewis conditions, the totality of which we have called Lewis' Second Law of Economic Dynamics, are perfectly consistent with each other, despite the necessity of meeting Lewis'

MODEL 2
POPULATION GROWTH–2.5 PERCENT, INCOME GROWTH–4.5 PERCENT

Year	$Y = C + D$			C/Y	D/Y	Population Index	Index of: Per Capita C	Index of: Per Capita Y	$\frac{G_{C/P}}{G_{Y/P}}$
	1	2	3	4	5	6	7	8	9
0	100.00	80.00	20.00	80.0	20.0	100.0	100.00	100.00	...
1	104.50	83.08	21.42	79.5	20.5	102.5	101.31	101.95	.672
2	109.20	86.27	22.93	79.0	21.0	105.1	102.64	103.94	.670
3	114.11	89.58	24.53	78.5	21.5	107.7	103.98	105.96	.668
4	119.24	93.01	26.23	78.0	22.0	110.4	105.33	108.03	.664
5	124.61	96.57	28.04	77.5	22.5	113.1	106.69	110.14	.660
6	130.22	100.27	29.95	77.0	23.0	116.0	108.08	112.29	.657
7	136.08	104.10	31.98	76.5	23.5	118.9	109.46	114.48	.653
8	142.20	108.07	34.13	76.0	24.0	121.8	110.88	116.71	.651
9	148.60	112.19	36.41	75.5	24.5	124.9	112.29	118.98	.648
10	155.29	116.47	38.82	75.0	25.0	128.0	113.73	121.31	.644
11	162.28	120.90	41.38	74.5	25.5	131.2	115.18	123.68	.641
12	169.58	125.49	44.09	74.0	26.0	134.5	116.64	126.09	.638
13	177.21	130.25	46.96	73.5	26.5	137.9	118.11	128.55	.634
14	185.18	135.18	50.00	73.0	27.0	141.3	119.59	131.05	.631
15	193.51	140.29	53.22	72.5	27.5	144.8	121.09	133.61	.627
16	202.22	145.60	56.62	72.0	28.0	148.5	122.60	136.22	.624
17	211.39	151.14	60.25	71.5	28.5	152.2	124.16	138.83	.621
18	220.90	156.84	64.06	71.0	29.0	156.0	125.70	141.64	.617
19	230.84	162.74	68.10	70.5	29.5	159.9	127.25	144.40	.614
20	241.23	168.86	72.37	70.0	30.0	163.9	128.81	147.22	.610

Annual Average: Growth of D–6.6 percent, Growth of Y–4.5 percent; Ratio–1.47.

capita income per annum–and also despite the ceiling of 5 percent on the rate of growth of national income in poor economies with large agricultural sectors. As a consequence, self-sustaining growth is within the capacity of the poorer nations if they but have the sociopolitical fortitude to impose Lewis' distribution condition.

In the models above we held income growth constant, inasmuch as we assumed Y to be increasing at a rate of 2 percent per capita per annum and population growth in each case was a constant. In view of this, the increase in d–the share of national income being allocated to development expenditures–implies that the marginal capacity-output ratio (c) must be increasing throughout the Lewis transitional period. With c rising, and the share of Y allocated to consumer goods production constantly being reduced, it might appear that as the developing economies "crept over the threshold" they would be confronted with [illegible]

MODEL 3
POPULATION GROWTH–3 PERCENT, INCOME GROWTH–5 PERCENT

Year	$Y = C + D$			C/Y	D/Y	Population Index	Index of: Per Capita C	Index of: Per Capita Y	$\frac{G_{C/P}}{G_{Y/P}}$
	1	2	3	4	5	6	7	8	9
0	100.00	80.00	20.00	80.0	20.0	100.0	100.00	100.00	....
1	105.00	83.48	21.52	79.5	20.5	103.0	101.31	101.94	.675
2	110.25	87.10	23.15	79.0	21.0	106.1	102.63	103.92	.671
3	115.76	90.87	24.89	78.5	21.5	109.3	103.95	105.94	.665
4	121.55	94.81	26.74	78.0	22.0	112.6	105.30	108.00	.663
5	127.63	98.91	28.72	77.5	22.5	115.9	106.70	110.09	.662
6	134.01	103.19	30.82	77.0	23.0	119.4	108.00	112.23	.654
7	140.71	107.64	33.07	76.5	23.5	123.0	109.40	114.41	.652
8	147.74	112.28	35.46	76.0	24.0	126.7	110.80	116.63	.649
9	155.13	117.12	38.01	75.5	24.5	130.5	112.20	118.90	.649
10	162.89	122.17	40.72	75.0	25.0	134.4	113.64	121.21	.643
11	171.03	127.42	43.62	74.5	25.5	138.4	115.08	123.57	.640
12	179.59	132.90	46.70	74.0	26.0	142.6	116.53	125.97	.637
13	188.56	138.59	49.97	73.5	26.5	146.9	117.99	128.42	.633
14	197.99	144.53	53.46	73.0	27.0	151.3	119.45	130.91	.629
15	207.89	150.72	57.18	72.5	27.5	155.8	120.94	133.44	.626
16	218.29	157.17	61.13	72.0	28.0	160.5	122.44	136.04	.623
17	229.20	163.88	65.32	71.5	28.5	165.3	123.96	138.69	.619
18	240.66	170.87	69.79	71.0	29.0	170.2	125.48	141.38	.616
19	252.70	178.15	74.55	70.5	29.5	175.4	127.01	144.12	.612
20	265.32	185.72	79.60	70.0	30.0	180.6	128.56	146.92	.609

Annual Average: Growth of D–7.2 percent, Growth of Y–5 percent; Ratio–1.44.

Peterson's cruel dilemma, i.e., living standards falling and the output of consumer goods failing to keep pace with the rate of population growth.[51] One interesting consequence of putting Lewis' Second Law in the above arithmetic form is the refutation of Peterson's predictions.

The models show conclusively that a rising capital (or capacity) output ratio together with an increasing proportion of national income allocated to development purposes does not necessarily imply either falling living standards or a cruel dilemma between the demands of the present and the needs of the future, providing only that the speed of the distributional change is controlled. Lewis makes this clear in his Ely Lecture when he insists that while achieving

[51]

self-sustained growth means reducing the ratio of private consumption . . . the rate of change must inevitably be *slow* . . . . Any attempt to reduce the ratio of consumption faster than by about one-half-of-one percent of gross domestic product per year will defeat itself, and also create political unrest. It defeats itself because output cannot be increased without increasing consumption, since growth requires incentives. And it creates unrest because rapid economic growth produces social turbulence . . . . Attempts to move faster than this, whether through taxation, inflation, or rationing, are likely to end in riots. [52]

Indeed, the main point behind Lewis' controlled decrease in the C/Y ratio is that despite the need of developing countries to increase the share of Y allocated to capital or, more broadly, to development uses, providing only the switch from consumption to investment is paced at a rate of change as prescribed by his Second Law, not only will living standards not decline, but they can steadily increase. With per capita consumption increasing during the transition, fears of falling living standards certainly seem unwarranted. Furthermore, despite the steady reduction in the share of annual investment being allocated to increasing the capacity of consumer goods industries, the output of this sector has no trouble in outpacing population growth. Professor Peterson's predicted "downward pressures on the standard of life"[53] simply do not materialize.

Lewis also uses his new model to make the point that the relation between income growth, consumption, and savings (or more broadly, development expenditures) is not a simple one. Squeezing consumption to raise growth may be the worse policy since growth depends "also on consumption."[54] Yet Lewis stresses that without reducing the share of private consumption no progress can be made toward achieving self-sustaining growth. The real problem of the transition, if it *is* to be a transition, is how to keep living standards rising, in order to secure the required incentives, and at the same time increase the share of resources going to government services and capital formation. He has noted that while many of the underdeveloped countries in recent years have managed to attain a growth rate of national income of 2 percent per capita, very few have gone far in reducing the share of private consumption—"thus making no progress toward self-sustaining growth."[55] Lewis concludes that if and when foreign aid is ever given on the basis of self-help, "the rate of change of the ratio of [private] consumption will be a good index of self-help."[56]

That this assertion is not an arbitrary whim of Lewis is brought out by our formulation of Lewis' Second Law of Economic Dynamics. Given the imposition of the distribution condition (a steady but controlled reduction in the share of private consumption and a corresponding increase in the development expenditure ratio), a self-sustaining process of growth can be achieved since both the welfare and accumulation requirements can be met within the constraints set by Lewis' minimum

[52] Ely Lecture, p. 3, italics added.

[53] Peterson, "Investment and the Threshold of Economic Growth," p. 138.

[54] *Development Planning*, p. 163.

[55] *Ibid.*, p. 164.

[56] *Ibid.*

growth rate to secure "economic progress" and his growth ceiling for poor, largely agricultural economies. Therefore, if the primary goal of granting foreign aid is to assist poorer economies to achieve self-sustaining growth, thus making aid temporary, then a "country should get much aid if the proportion spent on government services and capital formation is rising fast, and should get no aid if this proportion is constant . . . . The test rules out any country which is not clearly proceeding towards making foreign aid unnecessary by mobilizing an increasing proportion of its own resources for investment in human and physical capacities."[57]

Although Lewis suspects that his proposal for granting foreign aid does not stand much chance of acceptance, still the idea of "rewarding achievement, and [taking] civil servants out of the business of planning social revolutions in other people's countries,"[58] must surely merit the consideration of all who are concerned with the efficient allocation of scarce resources among competing uses.

[57] "Foreign Aid," p. 22.

[58] *Ibid.*, p. 23.